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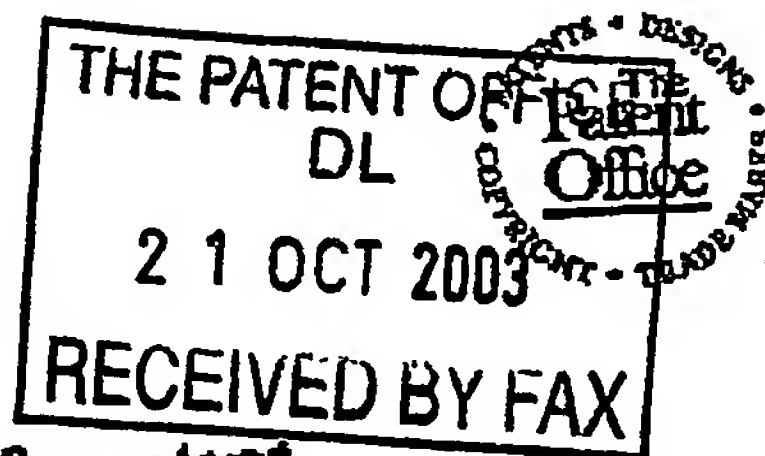
*L. Mahoney*

Signed

Dated 3 November 2004

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(Rule 16)21OCT03 E846182-1 001886  
POL/7700 0.00-0324525.5**Request for grant of a patent**

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21 OCT 2003

The Patent Office

Cardiff Road  
Newport  
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NP10 8QQ

1. Your reference

RD 448

2. Patent application number

*(The Patent Office will fill in this part)*

0324525.5

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

British American Tobacco (Investments) Limited  
Globe House  
1 Water Street  
London WC2R 3LA  
07515778003

Patents ADP number *(if you know it)*

If the applicant is a corporate body, give the country/state of its incorporation

England &amp; Wales

4. Title of the invention

Smoking Articles and Smokable Filler Material Therefor

5. Name of your agent *(if you have one)*

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

Patents Department  
British American Tobacco  
R&D Centre  
Regents Park Road  
Southampton SO15 8TL

Patents ADP number *(if you know it)*

07515778004

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number

Country

Priority application number  
*(if you know it)*Date of filing  
*(day / month / year)*

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing  
*(day / month / year)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'Yes' if)*

YES

a) any applicant named in part 3 is not an inventor, or  
b) there is an inventor who is not named as an applicant, or

c) any named applicant is a corporate body.

See note (d))

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Continuation sheets of this form

Description

10

Claim(s)

Abstract

Drawing(s)

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (Patents Form 7/77)

Request for preliminary examination and search (Patents Form 8/77)

Request for substantive examination (Patents Form 10/77)

Any other documents (please specify)

11.

I/We request the grant of a patent on the basis of this application.

Signature

Lucy E Henderson

Date 21/10/2003

12. Name and daytime telephone number of person to contact in the United Kingdom

Ms Lucy Henderson

02380 793727

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**Smoking Articles and Smokable Filler Material Therefor.**

This invention relates to smokable filler materials and a process for making same.

GB 1 013 303 describes a tobacco-containing foamed sheet material, which material is stabilised by increasing the viscosity of the foam by means of an adhesive, thereby preventing water drainage from the foam. Water drainage from a foam is a mechanism by which the foam collapses and, therefore, eventually loses the air trapped within the structure of the foam.

It is an object of the present invention to provide a smokable filler material having a stabilised foamed structure. The structure of the stabilised foam is such that the foam may be dried whilst substantially maintaining the filling power of the foamed structure.

It is a further object of the present invention to provide a smokable filler material having a stabilised foamed structure, the smokable filler material being capable of being blended with cut tobacco to form the filler of a smoking article or, indeed, being present as the sole filler in a smoking article.

In a first embodiment of the present invention there is provided a smokable filler material comprising a foaming agent capable of forming chemical cross-linkages and a cross-linking agent, such that when the foaming agent is in the foamed state thereof, and the cross-linking agent is added thereto, there is provided a stabilised foamed material.

Preferably the smokable filler material may further comprise a non-alginic foaming agent.

Suitably the smokable filler material may further comprise a non-foaming agent capable of forming chemical cross-linkages.

The smokable filler material may alternatively further comprise both a non-alginic foaming agent and a non-foaming agent capable of forming chemical cross-linkages.

Preferably the foaming agent capable of forming chemical cross-linkages is a foaming alginate. Most preferably the foaming alginate is an esterified alginate. Even more preferably the foaming alginate is propylene glycol alginate or the like.

A second embodiment of the present invention provides a smokable filler material comprising a non-alginic foaming agent, a non-foaming agent capable of forming chemical cross-linkages and a cross-linking agent, such that when the non-alginic foaming agent is in the foamed state thereof, and the cross-linking agent is added thereto, there is provided a stabilised foamed material.

Preferably the non-alginic foaming agent may be a foaming surfactant. Suitably the foaming surfactant may be one or more of the group including celluloses capable of foaming, for example hydroxylpropyl cellulose, methyl cellulose or ethyl cellulose, starch, proteins, for example egg albumin, sugar esters or other suitable foaming agents known to the skilled artisan.

Foaming of the foaming agent may be provided by the application of a mechanical force thereto or, alternatively, may be facilitated by the passing of a gas through the foaming agent. Foaming of the foaming agent may also be facilitated under conditions of pressure other than ambient ( $1\text{kg/m}^2$ ). Foaming may be facilitated in vacuo or under elevated pressure. In a further alternative, foaming may result from a chemical reaction, the reaction resulting in the production of a gas such as carbon dioxide, nitrogen or oxygen, for example. Further alternative means of foaming will be known to the skilled person.

Advantageously the non-foaming agent capable of forming chemical cross-linkages may be a soluble alginate such as sodium alginate, ammonium alginate or potassium alginate for example. Other suitable non-foaming alginates will be known in the art.

Other agents capable of forming chemical cross-linkages may include pectinaceous materials, for example. It will be understood that these materials may be non-foaming agents capable of forming cross-linkages or, alternatively they may be foaming agents capable of forming chemical cross-linkages. Other foaming and none



foaming agents will be readily appreciated by those skilled in the art. It will be further understood that in order that materials may be capable of foaming they may require chemical modification such as esterification, for example.

Advantageously the cross-linking agent is an agent which provides free calcium ions in aqueous solution. Preferably the cross-linking agent may be a calcium salt which salt is soluble or sparingly soluble at neutral pH (pH 7.0). Suitably the cross-linking agent may be one or more of calcium sulphate, calcium citrate, or the like.

Alternatively the cross-linking agent may be a calcium salt which is insoluble at neutral pH, which salt becomes soluble or sparingly soluble at acidic pH, calcium carbonate or calcium phosphate, for example. Alternatively, the cross-linking agent may be a calcium salt which is soluble or sparingly soluble, which salt forms an alkaline solution, calcium hydroxide for example. It will be clear to the skilled person that any source of free calcium ions may be utilised as a cross-linking agent in the present invention.

In an alternative embodiment of the present invention the cross-linking agent may be tobacco material. Advantageously when the cross-linking agent is tobacco the tobacco provides free Ca ions in the presence of water. It will be known to the skilled artisan that different types of tobacco provide different concentrations of free calcium ions in solution, therefore, the tobacco should be present in an amount capable of stabilising the foamed material by cross-linking.

In a further alternative, the smokable filler material may comprise, as a cross-linking agent, both tobacco and a further agent capable of providing free calcium ions.

Advantageously the cross-linking agent is present in an amount insufficient to induce syneresis of the stabilised foamed material. Syneresis occurs when the level of cross-linking agent is too great and the stabilised foam material begins to collapse due to the strength of the cross-linkages therein.

It will be understood that the solubility of soluble, or sparingly soluble, calcium salts in aqueous solution under ambient conditions may be changed by means

of alterations in temperature, for example. Suitable examples of calcium salts having altered solubility at temperatures other than ambient may be selected by reference to handbooks, such as CRC Handbook of Chemistry and Physics, 83rd Ed. David R. Lide.

When the agent capable of forming chemical cross-linkages is pectinaceous, the cross-linking agent may alternatively be an agent which provides multivalent or divalent cations, other than calcium, in solution. Suitable agents will be known to the skilled artisan.

It is much by preference that the smokable filler material of the present invention is a self-supporting foam when dried. Advantageously drying of the stabilised foamed material further stabilises the foamed structure and enables further processing thereof. It will be readily apparent to the skilled person that before drying the cross-linked foamed material is chemically stabilised. It is much by preference that in order to maintain stabilisation the foamed material is dried.

It is much by preference that the moisture content of the dried smokable filler material is in the range of 0% to about 30%. More preferably the moisture content of the dried smokable filler is in the range of about 5% to about 20%. Even more preferably the moisture content is between about 10% to about 15%. Most preferably the moisture content of the dried material is between about 12 to about 15%.

Advantageously the smokable filler material of the present invention is a chemically stabilised foamed material. Preferably the chemically stabilised foamed material substantially maintains a foamed structure upon drying of the material.

The smokable filler material of the present invention may optionally further comprise aerosol generating means, inert filler material, flavourant, colourant, fibrous material, carbonaceous materials, binders and/or tobacco material, or any suitable combination thereof.

Advantageously, when the smokable filler material further comprises aerosol generating means, the aerosol generating means preferably comprises aerosol forming means, such as polyhydric alcohols, glycerol, propylene glycol and triethylene glycol,

for example, or esters such as triethyl citrate or triacetin, or high boiling point hydrocarbons. Combinations of the aerosol forming means may also be used.

Preferably, when the foamed smokable filler further comprises inorganic filler material, the inorganic filler material is a particulate material. Advantageously the inorganic filler material is one or more of perlite, zeolite, alumina, vermiculite, diatomaceous earth, colloidal silica, chalk, magnesium oxide, magnesium sulphate, magnesium carbonate or other inorganic filler materials known to those skilled in the art.

The smokable filler material may further comprise a colourant to modify the appearance of the material, for example a colourant may darken the material, and/or a flavourant to impart a particular flavour. Suitable flavouring or colourant materials include cocoa, liquorice, caramel, chocolate or toffee, for example. Suitable flavourants include tobacco extract flavours, menthol and vanillin, for example. Other casing and/or flavouring materials may also be suitable.

The smokable filler material may further comprise a fibrous material in order to provide the material with one or more of higher strength, lower density or higher fill value. Suitably the fibrous material may be one or more of tobacco, wood pulp, cellulosic or alginic material.

The smokable filler material may further comprise a carbonaceous material. Suitable carbonaceous materials include, carbon, activated carbon in any suitable form. As used herein the term carbonaceous includes material which has been pyrolysed, which material preferably contains carbon, although some incomplete combustion products may still be present.

The smokable filler material may further comprise a binder material. The term binder in the context of the present invention shall be taken as meaning a material other than any of the following: the non-alginic foaming agent, non-foaming pectin or alginate or the foaming agent capable of forming cross-linkages.

The binder material is preferably chemically distinct from the foaming agent and the non-foaming alginate or pectin. It will be apparent to the skilled artisan that



certain materials will function as both foaming agents and as binders. Alternatively certain non-foaming agents capable of forming chemical cross-linkages may also function as binders in the present invention. It will be understood that the same, or similar, compounds may be present as a binding material in order that the physical properties of the dried, foamed smokable material be improved. The skilled artisan will be aware of the context of the inclusion of materials which have a dual function as described above. For example, propylene glycol alginate may be foamed and is capable of forming chemical cross-linkages, it may further be present, in the non-foamed state thereof, as a binder. A further example of a dual function material is hydroxypropyl cellulose which may be foamed as a non-alginate foaming agent and/or added in non-foamed state as a binder.

Suitable binders may be organic binders, for example, cellulose derivatives, such as sodium carboxymethylcellulose, methyl cellulose, hydroxypropylcellulose, hydroxyethyl cellulose or cellulose ethers, alginate binders including soluble alginates such as ammonium alginate, sodium alginate, sodium calcium alginate, calcium ammonium alginate, potassium alginate, magnesium alginate, triethanol-amine alginate and propylene glycol alginate, or insoluble alginates which can be rendered soluble by the addition of solubilising agents, such as ammonium hydroxide. Examples of these include aluminium, copper, zinc and silver alginates. Other organic binders include gums such as gum arabic, gum ghatti, gum tragacanth, Karaya, locust bean, acacia, guar, quince seed or xanthan gum, or gels such as agar, agarose, carrageenans, fucoidan and fucellaran. Pectins and pectinaceous materials can also be used as binders. Starches can also be used as organic binders. Other suitable gums can be selected by reference to handbooks, such as Industrial Gums, Ed. Whistler (Academic Press). Combinations of the above may also be used.

Suitably the smokable filler material may comprise tobacco. The tobacco may be present as a cross-linking agent or, alternatively, may be present in addition to a non-tobacco cross-linking agent.

It is much by preference that when the tobacco is present as a cross-linking agent the tobacco has a small particle size, for example less than 250µm. It will be understood that tobacco particles of various sizes may be used without deviating from the essence of the invention.

When the tobacco is present in addition to a cross-linking agent, the tobacco may be lamina, stem, fines, dust, reconstituted tobacco or other tobacco material.

The present invention further provides a smoking article comprising a rod of smoking material enwrapped in a wrapper, the smoking material comprising a blend, which blend incorporates the smokable filler material according to the present invention. Alternatively a smoking article provided in accordance with the present invention may comprise a rod of smoking material enwrapped in a wrapper, the smoking material consisting essentially of the smokable filler material of the present invention.

Preferably the wrapper is a conventional cigarette paper. Alternatively the wrapper may be as previously described in International Patent Publication Number WO 96/07336 or International Patent Publication Number WO 01/41590.

The smokable filler material of the present invention may be in the form of a sheet, which may be an extruded sheet, for example. Suitably if the material is in the form of a sheet, the sheet is shredded or cut before incorporation in a smoking article. Alternatively the smokable filler material according to the present invention may be laminated, thus forming a material having a stabilised foamed interior or layer. In a further alternative the smokable filler material of the present invention may be incorporated into a smoking article as strips or the material may be rolled before being enwrapped in a wrapper.

The present invention even further provides a method of producing a foamed smokable material comprising the steps of:

- a) producing a foam from a foaming agent, which foaming agent is capable of forming chemical cross-linkages;
- b) mixing said foam with a cross-linking agent;

- c) forming a slurry from said mix;
- d) casting said slurry; and
- e) drying said slurry to form a foamed sheet material.

In an alternative arrangement, step a) of a method according to one embodiment of the present invention may comprise the mixing of a foaming agent and a non-foaming agent capable of forming chemical cross-linkages and forming a foam therefrom. The skilled person will readily appreciate that steps b) and c) may be reversed in the described method.

In an alternative embodiment of the present invention there is provided a method of producing a foamed smokable material comprising the steps of:

- a) mixing a foaming agent capable of forming cross-linkages and a cross-linking agent; and
- b) extruding said mixture such that upon exiting an extruder die a stabilised foamed material is provided.

In an alternative arrangement of a method according to the present invention step a) may comprise the mixing of a foaming agent and a non-foaming agent capable of forming chemical cross-linkages with a cross-linking agent.

It will be readily understood from the foregoing description that the smokable filler material, when produced by extrusion, may be cross-linked before issuing from a die plate and/or after issuing from a die plate. Cross-linkage before issuance from a die plate may be facilitated by the addition of a cross-linking agent to the extrusion mix before the mix is added to the extruder. Alternatively a cross-linking agent may be added into the barrel of the extruder.

Cross-linking may be facilitated after issuance from a die plate. A foamed material may be extruded into a setting bath containing a solution of calcium ions or, alternatively, a solution of calcium ions may be applied to the foamed material by spraying. ~~Alternative processes for stabilising the foamed material during extrusion~~ will be readily appreciated by the skilled artisan.

It will be readily appreciated that the methods described hereinabove may be used to provide any smokable filler material according to the present invention.

In order that the present invention be understood and readily carried into effect reference will now be made to the following examples. The examples should not be taken as limiting the scope of the invention and suitable alternatives not detracting from the essence of the invention will be readily appreciated by the skilled artisan.

### Example 1

7.5g propylene glycol alginate (60-70% esterified) was hydrated in 492.5g water. The hydrated PGA was mixed in a food processor for 5mins at the highest speed setting of the processor. The PGA was foamed (aerated) by means of a high shear process which served to fractionate the bubbles within the foam. 0.75g calcium sulphate dihydrate was mixed with the foamed PGA under low shear conditions. The addition of the calcium sulphate dihydrate as a cross-linking agent begins the cross-linking process and causes the foamed PGA to begin form a stabilised foamed material by a gelling process. The resultant slurry was cast onto a flat surface at a depth of 2.5mm to 3.0mm. The slurry was dried at 22°C and 60% relative humidity. The dried cast material was removed from the flat surface using a doctoring blade.

Materials produced according to the described example had a bulk density of between about 10mg/cc and about 15mg/cc.

Table 1 shows the constitute materials of Examples 1-7, wherein a slurry was prepared and cast according to the process described in Example 1. All numerical references in Table 1 are expressed as percentages based on the final weight of sheet material and do not include water added during hydration of the materials.



**Table 1**

Examples							
(Numbers expressed are percentage of sheet components {excluding added water})							
	1	2	3	4	5	6	7
Foaming Agent							
Hydroxypropyl cellulose		28.2		-	19.7	24.7	
Foaming Agent capable of forming cross-linkages							
Propylene glycol alginate	91.0		50	68.2			85.6
Non Foaming Agent capable of forming cross-linkages							
Sodium alginate		65.7			46.0	57.8	
Glycerol				9.9	10.0	10.1	10.0
Caramel				-	-	2.1	2.0
Cross-Linking Agent							
Tobacco		-	50	20.0	20.0	-	-
CaSO <sub>4</sub>	9	6.1	-	1.9	4.3	5.3	2.4

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